TURFGRASS MANAGEMENT

Curriculum Content Frameworks

Please note: All assessment questions will be taken from the knowledge portion of these frameworks.

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Curriculum Content Frameworks

TURFGRASS MANAGEMENT

Grade Levels: 9,10, 11, 12 Course Code: 491360	Prerequisite: Agriculture Science and Technology or Agriculture Science
Course Description: This course covers all aspects of turfgrass management including lawn care, turf production, golf course management, sports turf, irrigation, equipment, maintenance, and human relations	

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Unit 1: Lawn Care and Turf Production
Hours: 15

Terminology: Auricle, Bahia grass, Bermuda grass, Bunch-type, Centipede grass, Collar, Cool-season turfgrasses, Crown, Cultivar (varieties), Cultivation, Dethatch, Drop spreader, Embryo, Endosperm, Essential nutrient elements, Evaporation, Evapotranspiration, Fertilizer, Fertilizer analysis, Fine fescues, Germination, Growth habit, Inflorescence, Inorganic fertilizer, Kentucky blue grass, Lawn, Lawn care service owner, Lawn care technician, Leaf blade, Leaf sheath, Ligule, Mulching, Organic fertilizer, Perennial rye grass, pH, Plugging, Primary root, Professional lawn profile, Reel mower, Renovation, Rhizome, Rotary mower, Rotary spreader, Scalping, Secondary roots, Seed, Seed coat, Seed Quality, Seed spreader, Seedbed, Shoot, Sod, Soil analysis, Soil profile, Soluble fertilizer, sports turf, Sprigging, St. Augustine grass, Stolon, Tall fescue, Thatch, Tiller, Time-released fertilizer, Transition zone, Transpiration, Turf, Turf quality, Turfgrass, Turfgrass science and management, Utility turf, Vernation, Warm-season turfgrass, Winter over-seeding, Zoysia grass

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		**ACADEMIC and WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
1.1 Define turf terms	1.1.1 Match terms with definitions	Foundation	Writing	Adapts notes to proper form [1.6.1] Applies and uses technical words and concepts [1.6.4] Records data [1.6.16] Uses technical words and symbols [1.6.20] Writes appropriate entries [1.6.22] Writes legibly [1.6.24]
1.2 Discuss career opportunities in the turfgrass industry and lawn care	1.2.1 Visit the Web and related sites for information on careers	Foundation	Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
	1.2.2 Research a career in the turfgrass industry to determine educational requirements, working conditions, salary, etc.	Personal Management	Career Awareness, Development, and Mobility	Comprehends ideas and concepts related to turfgrass industry [3.1.3] Explores career opprtunities [3.1.6]
	1.2.3 Research a career in the sports turf industry to determine educational requirements, working conditions, salary, etc.			
	1.2.4 Research training requirements for a lawn care or sports turf professional			

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
1.3	Discuss the benefits of lawns	1.3.1	Participate in a class discussion on the importance of lawns	Foundation	Reading	Analyzes and applies what has been read to specific tasks [1.3.2]
						Comprehends written information for main ideas [1.3.7]
					Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
					Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2]
1.4	Identify and describe the major parts of a typical turfgrass plant; auricle, collar, crown, leaf blade, leaf sheath, ligule, rhizome, shoot, stolon, tiller, vernation	1.4.1	Use grass morphology and reference materials to identify turfgrass species	Foundation	Reading	Applies/Understands technical words that apply to lawn care and turf production [1.3.6]
						Comprehends written information and applies it to task [1.3.8]
						Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
					Science	Applies knowledge to complete a practical task [1.4.3]
					Writing	Applies and uses technical words and concepts [1.6.4]
						Records data [1.6.16]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
1.5	List and describe the major factors affecting turfgrass growth; climatic, moisture, season length, zones, heat tolerence, light exposure, soil, (nutrients, compaction, depth, type, drainage pH)	1.5.1	Select turf grass species based on their adaptation to factors affecting growth	Foundation	Reading	Applies/Understands technical words that pertain to turfgrass growth [1.3.6] Comprehends written information and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
					Science	Applies knowledge to complete a practical task [1.4.3]
					Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Writes logical and understandable sentences [1.6.23]
1.6	Identify and describe cool and warm season turfgrasses; Bahia grass, Bermuda grass, Centepiede grass, Fine fescues, Kentucky blue grass, Perennial rye grass, St. Augutines grass, Tall fescue, Zoysia grass	1.6.1	Classify major turfgrass species as cool or warm season grasses	Foundation	Reading	Applies/Understands technical words that pertain to warm season turfgrasses [1.3.6] Comprehends written information and applies it to task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		1.6.2	List the qualities of warm and cool season turfgrasses		Science	Applies knowledge to complete a practical task [1.4.3]
					Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Writes logical and understandable sentences [1.6.23]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
1.7	Explain how a lawn is established or rennovated; seed, sod, plug, sprig	1.7.1	Calculate a lawn area	Foundation	Arithmetic/ Mathematics	Applies a mathametic formula to solve a problem [1.1.3] Calculates different units of measurement [1.1.6] Calculates/estimates quantities associated with establishing or renovating a lawn [1.1.8] Performs basic computations [1.1.31]
				Personal Management	Responsibility	Comprehends ideas and concepts related to lawn establishment or renovation [3.4.2] Exerts a high level of effort and perseverance towards goal attainment [3.4.4] Maintains a high level of concentration in completion of a task [3.4.7]
1.8	Explain the practices of maintaining a lawn; aerification, fertilizing, irrigating, mowing, pest management, thatch control	1.8.1	Locate two articles about lawn care from magazines, newsletters, or Internet publications	Foundation	Arithmetic/ Mathematics	Calculates dollar amounts [1.1.7]
		1.8.2	Create a price list of lawn care products		Reading	Analyzes and applies what has been read to specific tasks [1.3.2]
					Science	Applies scientific principals related to turf management [1.4.5]
					Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2] Organizes ideas and communicates oral messages to listeners [1.5.7]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
1.9	Describe the types of fertilizers used on lawns; organic, inorganic, soluble, time released	1.9.1	Visit a cooperative or extension agency and listen to an explanation of fertilizer types	Foundation	Reading	Applies/Understands technical words that pertain to types of fertilizers [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
					Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18] Writes logical and understandable sentences [1.6.23]
1.10	List the 16 essential nutrients required by turfgrasses	1.10.1	Recite the 16 essential elements for turfgrass growth	Foundation	Reading	Applies/Understands technical words that pertain to turfgrass production [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
					Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
1.11 Describe the basic lawn fertilization process	1.11.1 Calibrate a rotary spreader 1.11.2 Collect a soil sample 1.11.3 Analyze soil sample for fertilizer needs 1.11.4 Develop a fertilizer schedule	Foundation	Arithmetic/ Mathematics	Applies a mathematical formula to solve a problem [1.1.3] Calculates/Estimates quantities associated with establishing or renovating a lawn [1.1.8] Calculates percentages, ratios, proportions, decimals, and common fractions [1.1.10] Performs basic computations [1.1.31]
			Reading	Applies information and concepts derived from printed materials [1.3.3] Comprehends written specifications and applies them to a task [1.3.9] Reads and follows instructions to operate technical equipment [1.3.19]
			Writing	Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18]
1.12 Discuss and explain thatch	1.12.1 Identify thatch in a lawn 1.12.2 Recognize problems caused by thatch 1.12.3 Demonstrate how to remove thatch	Foundation	Reading	Applies/Understands technical words that pertain to thatch [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Adapts notes to a proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4] Takes notes from various sources [1.6.18]

Unit 2: Safety in Turfgrass Management
Hours: 5

Terminology: Accident, Hazard, Material Safety Data Sheet (MSDS), Risk, Safety

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**		**Skill Group**	**Skill**	**Description**
2.1 Define terms	2.1.1	Match terms to their definitions	Foundation	Writing	Applies/Understands technical words that pertain to safety in turgrass management [1.3.6]
2.2 Discuss the meaning and importance of safety and safe work in turfgrass management	2.2.1	Relate examples of safety hazards in turfgrass management, including equipment used in turf production and the inputs applied to plants such as pesticides and fertilizers	Foundation	Reading Speaking Integrity/Honesty/ Work Ethic	Distinguishes between fact and opinion [1.3.11] Asks questions to obtain information [1.5.4] Communicates a though, idea, or fact in spoken form [1.5.5]
	2.2.2	Have students name examples of accidents that have occurred locally in turfgrass management	Personal Management	Integrity/Honesty/ Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]
2.3 Identify hazards in turfgrass management	2.3.1	Survey hazardous situations in local turfgrass management facilities and prescribe the appropriate safety measures to be taken and propose ways of eliminating or reducing the risk of these hazards	Foundation Personal Management	Reading Integrity/Honesty/ Work Ethic	Analyzes and applies what has been read to specific task [1.3.2] Complies with safety and health rules in a given work environment [3.2.2]
	2.3.2	Develop a list of practices to reduce risk when working with turfgrass			

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
2.4	Describe the importance of personal safety in turfgrass management	2.4.1	Identify and properly use appropriate personal protective equipment (PPE) in turfgrass management	Foundation	Arithmetic/ Mathametics	Calculates dollar amounts [1.1.7]
		2.4.2	Calculate the cost of personal protective equipment (PPE) for an individual involved in turfgrass management	Interpersonal	Negotiation	Works to resolve conflict between two or more individuals [2.5.3]
		2.4.3	Work together with others to promote safety in turfgrass management	Thinking	Problem Solving	Comprehends ideas and concepts related to safety with turfgrass management [4.4.1]
		2.4.4	Take a test on turfgrass management safety before beginning work on turf			
2.5	Describe the safety practices used on or with rotary mowers	2.5.1	Participate in a discussion on the safe use of rotary mowers	Foundation	Writing	Adapts notes to proper form [1.6.1] Applies/Uses technical words and concepts [1.6.4]
2.6	List the safety practices used with a boom sprayer	2.6.1	Participate in a discussion on the safe use of a boom sprayer	Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammer, punctuation, capitalization, and spelling [1.6.3]

Unit 3: Golf Course Management
Hours: 15

Terminology: Aeration, Annual weeds, Apron, Assistant superintendent, Biennial weeds, Biological control, Biostimulants, Broadleaf weeds, Bunkers, Chemical mowing, Collar, Consultants, Coring, Creeping bent grass, Cup changing, Disease, Drainage, Educators and researchers, Endophyte, Fairway, Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Fertigation, Fibrous root system, Fungicide, Fungus, Golf course, Golf course architects, Golf course builders, Golf course management crew, Golf course superintendent, Grain, Grass-like weeds, Grubs, Hazards, Herbicide, Hydrojet, Hyphae, Infection, Integrated Pest Management (IPM), Irrigation technician, Larva, Localized dry spots, Manufactures, Mechanic, Nymph, O'clock pattern, Perennial weeds, Pesticide, Pesticide technician, Practice green, Professional writers, Putting green, Roughs, Sales representatives, Student interns, Support industries, Syringing, Tee, Topdressing, United States Golf Association (USGA), USGA specification, USGA stimpmeter, Weed, Wetting agents

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		**ACADEMIC and WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.1 Define golf course management terms	3.1.1 Match terms with definitions	Foundation	Writing	Records data [1.6.16] Takes notes from various sources [1.6.18] Writes appropriate entries [1.6.22] Writes/Prints legilby [1.6.24]
3.2 Describe the golf course maintenance industry	3.2.1 Research the industry	Foundation	Writing	Analyzes data, summarizes results, and makes conclusions [1.6.2] Applies rules of grammer, punctuation, capitalization, and spelling [1.6.3] Composes and creates documents; letters, manuals, reports, proposals, graphs, flow charts, etc. [1.6.8]
		Thinking	Knowing How to Learn	Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.3]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
3.3	Discuss careers in the golf course industry and career preparation; assistant superintendent, consultants, educators and researchers, golf course architects, golf course builders, golf course management crew, golf course superintendent, manufacturers, mechanic, pesticide technician, professional writers, sales representatives	3.3.1	Visit a golf course and interview the golf course superintendent or a maintenance crew leader	Personal Management	Career Awareness, Development, and Mobility	Explores career opportunities [3.1.6] Identifies education and training needed to achieve goals [3.1.8]
		3.3.2	Outline five jobs and their responsibilities in golf course management		Organizational Effectiveness	Analyzes mission statement, work objectives, and implementation plans [3.3.3]
		3.3.3	Print out a job announcement for a golf course superintendent			Identifies characteristics [3.3.6] Presents personal skills as benefits for company objective [3.3.7]
3.4	Label the layers of the putting green structure	3.4.1	Diagram a cross section of a putting green	Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
3.5	Describe the management requirements of putting greens, tees, and fairways: watering, mowing, fertilizing, aerifying, topdressing, etc.	3.5.1	Record the management practices for putting greens, tees, and fairways	Foundation	Speaking Writing	Applies/Uses technical terms as appropriate to audience [1.5.2] Organizes information into an appropriate format [1.6.10]
3.6	List stressful conditions affecting putting greens	3.6.1	Interview a golf course superintendent or maintenance crew leader regarding stresses on putting greens	Foundation	Science Writing	Applies a scentific principal to solve a problem [1.4.7] Uses language, style, organization, and format appropriate to subject matter, purpose, and audience [1.6.19]
3.7	Describe the major management practices used to keep roughs, bunkers, and hazards functional	3.7.1	Prepare a maintenance schedule for roughs, bunkers, and hazards	Foundation	Speaking Writing	Communicates a thought, idea, or fact in spoken form [1.5.5] Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6] Summarizes written information [1.6.17]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
3.8	List key factors influencing mowing quality	3.8.1	Perform proper mowing techniques	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
				Thinking	Decision Making	Evaluates information/data to make best decision [4.2.5]
3.9	Discuss the basic requirements of mowing greens	3.9.1	Watch a demonstration of the recommended mowing of putting greens	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
				Thinking	Reasoning	Applies rules and principals to a new istuation [4.5.1]
3.10	Compare the fertilization programs of greens, tees, fairways, and roughs	3.10.1	Prepare a fertilization schedule for greens, tees, fairways, and roughs	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
						Applies knowledge to complete a practical task [1.4.3]
3.11	Explain how fertilizer requirements are determined	3.11.1	Calculate the amount of fertilizer to be applied to a specific area	Foundation	Arithmetic/ Mathematics	Applies a mathamatical formula to solve a problem [1.1.3]
						Interprets charts, tables, graphs, and working drawings [1.1.25]
						Performs basic computations [1.1.31]
				Thinking	Problem Solving	Evaluate information/data to make best decision [4.2.5]
3.12	Discuss environmental issues in relation to fertilization	3.12.1	Participate in a debate on environmental issues associated with golf course fertilization	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
3.13	Identify turfgrass diseases; dollar spot, brown patch, *pythium* blight, snow mold and spring dead spot	3.13.1	Relate turfgrass disease symptoms to a disease	Foundation	Science	Describes/Explains scientific principles related to plant growth regulators [1.4.13]
						Observes health code/sanitation requirements [1.4.18]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.14 Outline disease control methods	3.14.1 Describe methods to manage turfgrasss disease	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies a scentific principal to solve a problem [1.4.7] Follows safety guidelines [1.4.15] Observes health code/sanitation requirements [1.4.18]
3.15 Identify weeds; annual weeds, biennial weeds, broadleaf weeds, grass-like weeds, and perennial weeds	3.15.1 Classify common weed plants as annual, biennial, broadleaf, grass-like, and/or perennial	Foundatioin	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]
3.16 Describe basic weed control and herbicide usage	3.16.1 Make recommendations for the control of weed species	Foundation Thinking	Science Problem Solving	Analyzes environmental ussues (ecology, pollution, waste management) [1.4.2] Applies a scentific principal to solve a problem [1.4.7] Follows safety guidelines [1.4.15] Measures dry and liquid supplies [1.4.16] Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]
3.17 Describe how insect pests attack turfgrass	3.17.1 Classify turfgrass insect pests according to the damage they cause	Foundation Thinking Skills	Science Problem Solving	Analyzes environmental ussues (ecology, pollution, waste management) [1.4.2] Describes/Explains scientific principles related to plant growth regulators [1.4.13] Draws conclusions from observations, evaluates conditions, and gives possible solutions [4.4.5]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
3.18	Identify insect species that are serious pests of turfgrasses; white grubs, cut worms, armyworms, chinch bugs and mole crickets	3.18.1	Draw the life cycle and outline the characteristics of white grubs, cut worms, armyworms, chinch bugs, and mole crickets	Foundation	Reading	Applies/Understands technical words that pertain to pests of turfgrasses [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
					Science	Applies knowledge to complete a practical task [1.4.3]
					Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from varous sources [1.6.18]
3.19	Explain how insect pests are managed	3.19.1	Recommend methods of managing insect pest populations	Foundation	Reading	Applies/Understands technical words that pertain to insect pests [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
					Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from varous sources [1.6.18]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.20 List the components and importance of IPM	3.20.1 Prepare a report on the components of an Integrated Pest Management (IPM) program and the theory behind Integrated Pest Management	Foundation	Reading	Applies/Understands technical words that pertain to subject [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtin factual information [1.3.23]
			Science	Applies knowledge to complete a practical task [1.4.3]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from varous sources [1.6.18]
3.21 List the types of pesticides used on golf courses	3.21.1 Interview a golf course superintendent or a maintenance crew leader on the types of pesticides commonly used on golf courses	Foundation	Reading	Applies/Understands technical words that pertain to pesticides [1.3.6] Comprehends written information and applies it to a task [1.3.8] Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
			Writing	Applies/Uses technical words and concepts [1.6.4] Records data [1.6.16] Takes notes from varous sources [1.6.18]

Unit 4: Sports Turf
Hours: 10

Terminology: 3-4-5 triangle, Automatic level, Baseball/softball field, Football field, Global Positioning Satellite (GPS), GPS receiver, Grade, Grade stakes, Leveling, Leveling rods, Plumb, Plumb bob, Regulation pitcher's mound, Skinned area, Slope, Soccer field, Sports field technician, Waypoints

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		**ACADEMIC and WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
4.1 Define sports turf terms	4.1.1 Match terms to definitions	Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information into an appropriate format [1.6.10] Writes logical and understandable sentences [1.6.23]
4.2 Describe the main types of sports fields: football field, baseball field, and soccer field	4.2.1 Layout the dimensions of the main types of sports fields	Foundation	Speaking	Applies/Uses technical terms as appropriate to audience [1.5.2]
	4.2.2 Sketch the main types of sports fields and label the dimensions		Writing	Applies/Uses technical words and concepts [1.6.4]
4.3 Identify major turfgrasses used for sports fields and the characteristics that make them useful	4.3.1 Select turfgrass species based on their characteristics for use on sports fields	Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do			ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**		**Skill Group**	**Skill**	**Description**
4.4 Explain the layout and flagging of a course to dimension using surveying equipment and GPS technology	4.4.1	Set up a tripod	Foundation	Science	Applies scientific principals related to survey using traditional methods [1.4.1]
	4.4.2	Mount a survey instrument			Applies knowledge to complete a practical task [1.4.3]
	4.4.3	Level the instrument			Applies scentific principals related to layout a sports field [1.4.5]
	4.4.4	Read a leveling rod using the surveying instrument			Applies scientific principals related to survey using GPS technology [1.4.5]
	4.4.5	Layout and flag a course to survey			Uses equipment and techniques to survey using tradional methods [1.4.23]
	4.4.6	Layout and flag a course to survey using GPS technology			Uses equipment and techniques to layout a sports field [1.4.23]
	4.4.7	Measure a high school or area athletic field			Uses equipment and techniques to survey using GPS technology [1.4.23]
	4.4.8	Verify local athletic field sizes using GPS technology		Speaking	Adapts presentation to audience [1.5.1]
					Applies/Uses technical terms as appropriate to audience [1.5.2]
			Thinking	Problem Solving	Comprehends ideas and concepts related to traditional surveying methods [4.4.1]
					Comprehends ideas and concepts related to sports fields [4.4.1]
					Comprehends ideas and concepts related to GPS technology [4.4.1]
					Devises and implements a plan of action to resolve problem [4.4.3]

Unit 5: Turf Irrigation
Hours: 5

Terminology: Application rate, Bubbler, Controller, Design capacity, Flow, Gallons Per Minute (GPM), Head-to-head, Installed irrigation system, Irrigation, Lateral lines, Main supply line, Point of connection, Pop-up sprinklers, Pressure, Radius of throw, Rotors, Slope, Spray heads, Sprinklers, Station, Uniformity

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
5.1 Define irrigation terms	5.1.1 Match terms with definitions	Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information into an appropriate format [1.6.10] Writes logical and understandable sentences [1.6.23]
5.2 Compare irrigation systems	5.2.1 Outline the pros and cons of the different types of irrigation systems	Foundation	Speaking	Communictes a thought, idea, or fact in spoken form [1.5.5] Organizes ideas and communicates oral messages to listeners [1.5.7]
			Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information into an appropriate format [1.6.10]
5.3 Determine the type and number of sprinklers necessary to irrigate a certain area	5.3.1 Calculate the type and number of sprinklers needed for an area 5.3.2 Sketch a 2 dimensional layout of a property 5.3.3 Measure items for a plan (including beds, trees, shrubs, buildings, driveways, etc.) 5.3.4 Sketch an accurate irrigation plan	Foundation	Arthimetic/ Mathematics	Draws to scale [1.1.20] Intreprets charts, tables, graphs, and working drawings [1.1.25] Makes precision measurements using appropriate instruments [1.1.27]
			Science	Acquires and processes scientific data [1.4.1] Applies knowledge to complete a practical task [1.4.3] Applies scientific principals related to sprinkler irrigation [1.4.5] Reads measurements from common measuring devices [1.4.20]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
5.4	List the key factors influencing irrigation quality: PSI, water quality	5.4.1	Interview an irrigation technician to learn about factors that influence irrigation quality	Foundation	Writing	Applies/Uses technical words and concepts [1.6.4] Organizes information into an appropriate format [1.6.10] Writes logical and understandable sentences [1.6.23]

Unit 6: Equipment and Equipment Maintenance
Hours: 10

Terminology: Agitator, Air cooled engine, Bedknife, Boom sprayer, Calibrate, Carburetor, Combustion, Connecting rod, Crankshaft, Cylinder head, Discharge mower deck, Engine block, Environmental Protection Agency (EPA), Flywheel, Fuel injector, Gallons per acre (GPA), Governor, Ground driven reel, Hydraulic driven reel, Injection pump, Internal combustion engine, Mower operator, Multicyclinder, Nozzle, Octane, Operator, Piston, Piston rings, Pressure guage, Pump, Reel, Regulator valve, Valves

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				**ACADEMIC and WORKPLACE SKILLS** What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
6.1	Define equipment and maintenance terms	6.1.1	Match terms with definitions	Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammer, punctuation, capitalization, and spelling [1.6.3]
6.2	Identify the basic components of small engines used on golf course equipment	6.2.1	Locate and name the basic components of a small engines	Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
6.3	Differentiate between the component functions of two and four cycle engines	6.3.1	Report on the advantages and disadvantages of two and four cycle engines	Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
6.4	List maintenance procedures recommended for small engines	6.4.1	Change the oil in a lawn mower or small gas engine	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies knowledge to complete a practical task [1.4.3] Applies scientific principals related to maintenance of rotary mowers [1.4.5]
		6.4.2	Service the air cleaner			
		6.4.3	Clean a fuel tank and line			
		6.4.4	Clean carburator float bowl			
		6.4.5	Replace the spark plug			
		6.4.6	Clean engine of all dirt and debris			
		6.4.7	Examine engine for loosened bolts or other parts and tighten			
6.5	Discuss the differences between diesel and gasoline engines	6.5.1	Prepare a list of characteristics associated with diesel and gasoline engines	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies knowledge to complete a practical task [1.4.3]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
6.6 List the maintenance procedures used for mowers	6.6.1 Remove and sharpen the mower blades	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2] Applies knowledge to complete a practical task [1.4.3] Applies scientific principals related to maintenance of rotary mowers [1.4.5]
6.7 Identify the components of a boom sprayer	6.7.1 Locate and name the components of a boom sprayer	Foundation	Writing	Adapts notes to proper form [1.6.1] Applies rules of grammer, punctuation, capitalization, and spelling [1.6.3] Applies/Uses technical words and concepts [1.6.4]
6.8 Discuss the process of calibrating a boom sprayer	6.8.1 Calibrate a boom sprayer	Foundation	Arithmetic/ Mathematics	Applies addition, subtraction, and division to real-world situations [1.1.1] Applies a mathematical formula to solve a problem [1.1.3] Calculates different units of measurement [1.1.6] Calculates measurements taken from measuring devices [1.1.9] Chooses appropriately from a variety of mathematical techniques [1.1.11] Comprehends mathematical ideas and concepts related to calibrating a boom sprayer [1.1.13] Computes using a formula [1.1.14] Demonstrates mathematical calculation [1.1.19] Performs basic computations [1.1.31]

CAREER and TECHNICAL SKILLS What the Student Should be Able to Do				ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge		**Application**		**Skill Group**	**Skill**	**Description**
6.9	Explain the maintenance of sprayers	6.9.1	Report on the maintenance practices associated with a boom sprayer	Foundation	Science	Analyzes environmental issues (ecology, pollution, waste management) [1.4.2]

Glossary
Unit 1: Lawn Care and Turf Production

1. Auricle – a pair of tiny appendages between the leaf blade and sheath

2. Bahia grass (Paspalum notatum) – a course textured grass that is adapted to mild coastal climates and used for low quality and maintenance turf

3. Bermuda grass (Cynodon spp.) – a group of the most popular warm-season turfgrasses, including several species and hybrids, which are used in the warmer regions for all levels of turf from putting greens to low-quality turf

4. Bunch-type – a type of growth habit with tillers as new shoots; includes tall fescue and perennial ryegrass

5. Centipede grass (Eremochloa ophiuroides) – grass that has a medium-coarse texture with light green color and slow growth habit; tolerates shade but not traffic or wear

6. Collar – a light-colored band between the leaf blade and sheath on the lower side of the leaf

7. Cool-season turfgrasses – turfgrasses that can only adapt in the cooler regions with the best temperature range from 65f to 80f; they generally have better growth during the spring and fall seasons

8. Crown – the major growing area of a grass located at the base of the grass near the soil surface; also called the compacted stem of a grass

9. Cultivar (varieties) – a subdivision used to descrbe different grasses within the same species

10. Cultivation – working of the soil without destroying the turf

11. Dethatch – any methods used to reduce the thatch layer of a lawn

12. Drop spreader – a type of spreader, which is used to spread seeds or granular materials

13. Embryo – the part of a seed that develops into a young plant

14. Endosperm – the part of a seed that stores food for seed germination

15. Essential nutrient elements – sixteen elements needed by plants including turfgrasses; carbon (C), oxygen (O), hydrogen (H), nitrogen (N), phosphours (P), potassium (K), calcium (Ca), magnesium (Mg), sulfer (S), iron (Fe), zinc (Zn), copper (Cu), manganese (Mn), molybdenum (Mo), boron (B), chlorine (Cl)

16. Evaporation – the process of water losses from a water body or a surface

17. Evapotranspiration – the combination of evaporation and transpiration; described as a layer of water lost from a planted area in millimeters (mm)

18. Fertilizer – a material containing one or more essential nutrients; can be safely used to grow plants and can be in granular or liquid form

19. Fertilizer analysis – the percentage by weight given on the fertilzer bag; i.e., a 23-7-7 fertilizer contains 23% nitrogen, 7% phosphorus (P_2O_5), and 7% potassium (K_2O)

20. Fine fescues (Festuca spp.) – a medium texture, bunch-type turfgrass commonly used in cold and cool zones

21. Germination – the start of new seedlines; requires proper moisture, temperature, oxygen, and nutrient conditions

22. Growth habit – the growing pattern by which a turfgrass spreads itself; three types include stoloniferous, ehizomatous, and bunch-type

23. Inflorescence – the flowers of a plant where seeds are developed by are also called seed head

24. Inorganic fertilizer – a fertilizer made of inorganic salts with a quiick release rate such as potassium nitrate (KNO_3)

25. Kentucky blue grass (Poa prantensis) – a medium leaf texture, rhizomatous grass most commonly used as lawn turfgrass in cold or cool zones

26. Lawn – a type of maintained tuft that is maintained surrounding a residential house or public building

27. Lawn care service owner – a trained indicidual who runs a lawn care business and service

28. Lawn care technician – a trained individual who provides mowing, fertilization, and pest control treatments to lawns and follow-up customer service to a territory route of several dozens to hundreds of homeowners

29. Leaf blade – the upper portion of a grass leaf

30. Leaf sheath – the lower portion of a grass sheath

31. Ligule – a membranous or hairy structure on the inside of a leaf at the junction of the leaf blade and sheath

32. Mulching – any material used to cover a newly established or renovted turf, usually straw

33. Organic fertilizer – a fertilizer from natural organic materials such as animal manure, dead plant and animal materials, sewage sludge, bone meal, and blood meal, or from synthetic organic materials such as urea, sulfur coated urea, and other urea containing materials; except urea, organic fertilizers are slow release fertilizers

34. Perennial rye grass (Lolium perenne) – a medium texture, bunch-type turfgrass commonly used in cold and cool zones

35. pH – the measurement of the acidity or alkalinity of a soil; 7.0 is neutral, below 7.0 is acidic, above 7.0 is alkaline

36. Plugging – a method of establishing a new turf using turf plugs harvested from a mature turf

37. Primary root – the first root from a germinating seed

38. Professional lawn care – an industry that specializes in lawn care and directly provides lawn care service to homeowners

39. Reel mower – a mower that has a rotating reel with blades, which cut against a stationary bed-knife

40. Renovation – a practice of improving a poor turf

41. Rhizome – a spreading stem that grows underground and produces new shoots and roots at the nodes

42. Rotary mower – a mower that cuts grass leaves by the impact of a rapid rotating blade

43. Rotary spreader – a type of spreader used for broadcast application of seeds and fertilizers

44. Scalping – excessive removing of green leaves resulting in a brown appearance by exposing dead leaves or even bare soil; main cause is lower mowing height or uneven turf

45. Secondary roots – the lateral roots from the crown region

46. Seed – a ripened ovule with the potential to germinate a new plant

47. Seed coat – the outside protective layer of a seed

48. Seed quality – a term used to describe the germination rate (based on 100 seeds) and the purity of the seeds

49. Seed spreader – a tool used to apply seed; two kinds of seed spreaders commonly used: rotary spreader and drop spreader

50. Seedbed – a site prepared for starting a new turf

51. Shoot – an upright unit of a turfgrass including several leaves and a growing point in the base; a turfgrass plant may have many shoots; without mowing, each shoot has a potential to produce a seed head; after producing a seed head, the shoot finishes its function and dies; the death of a single shoot would not affect the plant, which has multiple shoots

52. Sod – a harvested turfgrass unit in a thin layer with soil and roots intact used for new turf establishment

53. Soil analysis – a printout of the results of a soil test which includes soil ph, organic matter %, component %, as well as levels of available nutrients

54. Soil profile – a vertical view of the soil layers usually obtained by using a probe

55. Soluble fertilizer – dissolve completely in water and stay in solution

56. Sports turf – a type of turf that is maintained as the cover of a sports field to protect athletes and reduce the damage to the field

57. Sprigging – a method to use pieces of stolons cut from a mature turf to start a new turf; these pieces are called spriggs, which usually are planted in furrows

58. St. Augustine grass (Stenotaphrum secundatum) – a course texturedm shade tolerant, fast growing grass; this salt tolerant grass does well in coastal areas, but is vary rarely availble by seed

59. Stolon – a spreading stem that grows along the surface of the ground and produces new shoots and roots at the nodes

60. Tall fescue (Fescue arundiacea) – a coarse texture, bunch type turfgrass commonly used in cold, cool, or or transition zones

61. Thatch – the accumulation of dead roots and stems, mostly at soil surface or immediately above

62. Tiller – a stem that develops from the crown of the parent plant and grows upwards within the enclosing leaf sheath of the parent plant

63. Time-released fertilizer – continually discharge a small amount of nutrients over a period of time

64. Transition zone – the zone between the warm season and the cool season zones, whre both warm and cool season grasses can be grown but where the climate is not optimal for either

65. Transpiration – water losses through a plant body; it cools off the body temperature of a plant; on the average, during a hot summer day, a plant can lose 90% that it has absorbed

66. Turf – the general name for an area covered with maintained turfgrass

67. Turf quality – the appearance and function of a turf; turf quality is evaluated by color, smoothness, density of shoots, leaf texture, uniformity, growth habit, pest resistance, playing conditions, and recovery rate after damage

68. Turfgrass – a type of grass with spreading growth habit and tolerance to mowing and traffic; most are pereennials

69. Turfgrass science and management – the science, art, and business of cultivating turfgrasses for various purposes

70. Utility turf – a type of turf, such as highway and airport turf, that is used to reduce soil erosion and to protect the environment

71. Vernation – the arrangement of the youngest leaf in the budshoot either folded or rolled

72. Warm-season turfgrass – one fo the two major groups of turfgrass, which can grow well during the summer season at a temperture of 80f to 95f and go to dormancy during the winter season when the temperature is below 32f, the other group of turfgrass is called cool-seson turfgrass, which can grow well in a temperature range from 65f to 80f

73. Winter over-seeding – a practice used in the southern regions during the winter time; a cool seson turfgrass is seeded on a wam season turfgrass in the late fall when the warm season turfgrass starts to go dormant, the winter over-seeded turfgrass only lasts for one winter and will die out the next spring when warm-season turfgrass starts to grow, the most common turfgrass used for winter overseeding is perennial ryegrass

74. Zoysia grass (Zoysia japonica) – a dense, hardy turf that endures both high temperatures and humidity; tolerates low maintenance, although it is slow growing with a long winter dormancy period; improved seed varieties available; very winter hardy

Unit 2: Safety in Turfgrass Management

1. Accident – an event that happens unexpectedly or unintentionally
2. Hazard – exposure to danger or harm
3. Material Safety Data Sheet (MSDS) – a sheet containing information about the safe use of a chemical and the steps to take in case of an accident
4. Risk – the chance that an accident might occur during a research project
5. Safety – a state of being free of danger and injury

Unit 3: Golf Course Management

1. Aeration – a practice used to improve soil conditions by removing soil cores or slicing the soil without destroying the lawn; methods include coring, slicing, vertical cutting, and dethatching
2. Annual weeds – weeds which finish a life cycle within a year such as crabgrass and common chickweed
3. Apron – the front area between a green and the fairway
4. Assistant superintendent – an assistant to a superintendent, serving as superintendent when the superintendent is absent; this position usually attracts a recent college graduate majoring in golf course management or related areas with experience in golf course management
5. Biennal weeds – weeds which finish a life cycle within two years, such as bull thistle and wild carrot
6. Biological control – use of one organism to control another pest
7. Biostimulants – plant growth promoters extracted from other living organisms containing one or more types of plant hormones
8. Broadleaf weeds – dicotyledonous weeds such as plantains and clovers
9. Bunkers – a hazard consisting of a depression area of bare ground usually covered with sand
10. Chemical mowing – using chemicals (plant growth regulators) to reduce the growth of turfgrasses in order to reduce the frequency of mechanical mowing without compromising the turf quality
11. Collar – the zone surrounding the green, ranging from two feet to several feet wide; its mowing height is a little higher than the putting green
12. Consultants – people who provide technical information and advice on golf course management
13. Coring – a method of turf cultivation in which soil cores are removed by hollow tines
14. Creeping bent grass – the most important cool-season turfgrass for golf courses in the northern climates; it can be used on putting greens, tees, and fairways in northern climates and in the transition zone
15. Cup changing – a daily routine to change the location of the ball cup following certain patterns (to be uniformly used for the 18 holes); all cups to the front of the green, back of the green, or so on
16. Disease – an abnormal, unhealthy disorder of a plant caused either by a pathogen or an unfavorable condition
17. Drainage – the means of getting rid of excessive water on golf courses
18. Educators and researchers – people who conduct research and education to support the golf industry
19. Endophyte – a plant living within another plant

20. Fairway – the area between tees and greens with a mowing height of 1/4 to 1 inch depending on turfgrass species and cultivars

21. Federal Insectide, Fungicide, and Rodenticide Act (FIFRA) – In general: A state may regulate the sale or use of any federally registered pesticide or device in the state, but only if and to the extent the regulation does not permit the sale of distribution of the federally registered pesticide allowed under this act. Uniformity: Such state shall not impose or continue in effect any requirements for labeling or packaging in addition to or different from those required under this act; for more information, conduct an Internet search for FIFRA

22. Fertigation – applying fertilizers with the irrigation water

23. Fibrous root system – a root system without a main root; all grasses have a fibrous root system

24. Fungicide – a pesticide used to control a disease caused by fungi

25. Fungus – a type of microorganism producing mycelium and spores without chlorophyll; most turfgrass diseases are caused by fungi which feed on turfgrasses

26. Golf course – a site of golf with various holes covered by all levels of maintained turf including putting greens, tees, fairways, and roughs

27. Golf course architects – people who design golf courses including some professional golfers

28. Golf course builders – people who build or rennovate golf courses

29. Golf course management crew – a team of three to several dozens of people with special training to maintain a golf course including mowing, irrigatiing, fertilizing, pest control, ground maintenance, tournament preparation, and other aspects to keep the golf course's playability

30. Golf course superintendent – the supervisor and leader of the golf course management crew; a superintendent is usually required to have a college degree or training in golf course management, turfgrass management, or related areas; skills in financial management and human resource management are also necessary; it usually takes a person two to three years of experience as an assistant superintendent before he or she can become a superintendent

31. Grain – turfgrass leaves all lie in one direction due to multiple mowing passes in the sam direction

32. Grass-like weeds – weeds, which are not grasses but look like grasses, such as wild garlic and nut sedges

33. Grubs – a soft, thick wormlike larva of an insect

34. Hazards – any bunker or water hazard

35. Herbicide – a type of pesticide used to kill weeds

36. Hydrojet – a method using high pressure (5,000 psi) water injection into the turf to loosen soil compaction without producing soil cores and destruction of the playability

37. Hyphae – the threadlike filaments of the fungus body

38. Infection – the invasion and establishment of a disease-causing microorganism (pathogen) within a plant

39. Integrated Pest Management (IPM) or Intelligent Plant Management – combining methods to control pests, such as resistant plant varieties, chemical and biological pesticides, pest exclusion, and plant health management

40. Irrigation technician – a trained specialist responsible for maintenance of the irrigation systems on a golf course

41. Larva – the immature, wingless, and often wormlike feeding form that hatches from the egg of many insects, alters chiefly in size while passing through several molts, and is finally transformed into a pupa or chrysalis from which the adult emerges

42. Localized dry spots – a dry spot of turf that resists rewetting by normal irrigation and rainfall; it can be associated with thick thatch, fungi activity, and other poor soil conditions; it happens often on putting greens

43. Manufacturers – companies that produce golf course maintenance related products, such as tools, equipment, and chemicals

44. Mechanic – a trained specialist responsible for repairing and maintaining equipment including mowers, sprayers, and related machines

45. Nymph – any of various immature insects; especially a larva of an insect (such as a grasshopper, true bug, or mayfly) with incomplete metamorphosis that differs from the imago especially in size and in its incompletely developed wings and genetila

46. O'clock pattern – mowing directions to follow; 12-6 o'clock is set as the direction from tee to the green

47. Perennial weeds – weeds that can live many years

48. Pesticide – an agent used to destroy pests

49. Pesticide technician – a trained specialist responsible for pest management and application of pesticides with a pesticide license

50. Practice green – the green area of a golf course used for practice of putting usually near the clubhouse

51. Professional writers – people who write professional articles for magazines, newsletters, and Internet publications

52. Putting green – the area to put the ball into a hole; the area on a golf course with the lowest mowing height (between 1/10 to 2/16 inches) and a smooth surface due to the ball speed requirement

53. Roughs – the areas that are covered with turfgrasses and surrounding the putting green, fairway, and tees and provides the background on which the game is played

54. Sales representatives – people who sell products to golf courses including fertilizers, pesticides, equipment, and irrigation supplies

55. Student interns – college students working on a golf course majoring in golf course management or related areas to meet course credit requirements for a college degree

56. Support industries – any industries that are related to the establishment and maintenance of a turf such as the fertilizer industry, pesticide industry, equipment industry, or irrigation industry

57. Syringing – a light irrigation during a summer day to cool off the turf surface

58. Tee – the area to start a hole; a tee is mowed at 3/8 to 3/4 inch depending on turfgrass species and cultivars

59. Topdressing – spreading a thin layer of soil mix or sand over a turf area and working it into the turf to stimulate thatch decomposition and to smooth the surface

60. United States Golf Association (USGA) – founded in 1984

61. USGA specification – a commonly used construction model to enhance the putting green quality; it includes 12 to 14 inch root mix zone with sand and peat moss mixture (by volume: 90-90% of sand; 10-20% of peat moss), a coarse sand zone of 2 to 4 inches, and a pea gravel and course gravel zone; a sub-drainage system is underneath these layers

62. USGA stimpmeter – an instrument to measure bass speed in feet and inches; the desired ball speed range is between 9 to 11 feet

63. Weed – a plant growing in a wrong place

64. Wetting agents – a material that is applied to a turf to enhance water use by turfgrass

Unit 4: Sports Turf

1. 3-4-5 triangle – a direct application of the Pythagorean Theorem; to lay out a square cornor, locate a point and measure 30 feet down one side of the field and 40 feet down the other side from that corner; measure the diagonal distance between the end of the 30 foot line and the end of the 40 foot line; if the diagonal is 50 feet, the corner is square

2. Automatic level – introduced in this country in 1948 by Zeiss Company of West Germany, this tool is used most often to determine elevations and to set up level points over long distances; it adjusts more quickly than traditional levels and has a high degree of accuracy

3. Baseball/softball field – a field that occupies an area between 1.4 to 4.5 acres and is normally covered with turf and special clay on the skinned areas

4. Football field – a field with a dimension of 300 by 165 feet for the game of football, normally covered with turf

5. Global Positioning Satellite (GPS) – a navigational system using satellite signals to fix the location of a receiver on or above the earth's surface

6. GPS receiver – receiver used to receive satellite signals to fix the location on or above the earth's surface

7. Grade – the degree of inclination of a road or slope

8. Grade stakes – stakes used to mark the inclination of a road or slope

9. Leveling – a process used to determine the difference in elevation on a particular piece of land; it clearly shows any high or low spots on the field

10. Leveling rods – can be made of wood, fiberglass, plastic, or aluminum; designed to be used with the auto level and other leveling instruments; most leveling rods have adjustable sections; the numbers and graduation marks are large so they are easily read; the engineer's rod is graduated in feet, tenths of a foot, and hundredths of a foot

11. Plumb – exact vertical and perpendicular line; it would be at a 90 degree angle to a level plane (the field)

12. Plumb bob – a tool used to test or establish vertical lines; based on the fact that when a weight is suspended from a line, it will cause the line to fall vertically (90 degrees) to a horizontal; the common plumb bob is ground and polished to a point on the lower end; the top is provided with a screw on cap through which a line is passed; the line is used to suspend the plumb bob under the leveling instrument

13. Regulation pitcher's mound – the diameter of a pitcher's mound is 18 feet, with 10 feet from the foot of the rubber, toward home plate and 8 feet from the back of the rubber; a regulation pitcher's mound is 10 1/2 inches high (compared to the surface level of home plate)

14. Skinned area – the bare ground of a baseball field

15. Slope – refers to the incline or difference in elevation from one part of the property to another

16. Soccer field – a field with a dimension of 300 to 360 by 160 to 225 feet for the game of soccer, normally covered with turf

17. Sports field technician – a technician responsible for the maintenance of sports fields

18. Waypoints – coordinates on a GPS map or route which can be used for various uses such as maps, trails, layout of fields, etc.

Unit 5: Turf Irrigation

1. Application rate – the rate at which water is applied to the turf or ornamental plantings; the amount of water applied to a given area in an hour
2. Bubbler – a water emission device that applies water to the soil surface using an umbrella-type pattern
3. Controller – also known as a timer, the part of an automatic sprinkler system that determines when a valve will turn on and how long it will operate
4. Design capacity – measured in Gallons Per Minute (GPM) – standard measurement of water flow
5. Flow – the movement of fluids, through pipes, fittings, and valves
6. Gallons Per Minute (GPM) – standard measurement of water flow
7. Head-to-head – the placement of sprinkler heads so that one sprinkler will spray another sprinkler (or 50% of the adjusted diameter)
8. Installed irrigation system – a network of underground pipes and pop-up sprinklers, controlled by manual or automatic valves, which supplies water to a playing field or other designated areas
9. Irrigation – the process of supplying water to a stand of turfgrass or other plant culture
10. Lateral lines – non-pressure pipes that connect valves to sprinkler heads
11. Main supply line – the only line on the field that has continual water pressure and supplies water to all lateral lines
12. Point of connection – location where the irrigation system is connected to the main water system
13. Pop-up sprinklers – sprinkler head which is a part of a permanent sprinkler system; head "pops up" when the water is turned on to distribute water and drops back to soil level when the water is turned off
14. Pressure – measured with a pressure guage and expressed in pounds per square inch (PSI); the amount of energy available to move water through pipe, valves, sprinklers, or other components of the irrigation system
15. Radius of throw – the distance from the sprinkler head to the farthest point of water application
16. Rotors – gear-driven sprinklers that spray a solid stream of water and rotate slowly in a circular pattern, applying water to areas as large as 75 feet or more
17. Slope – refers to the incline or difference in elevation from one part of the property to the other
18. Spray heads – sprinklers that emit a fan-type spray of small droplets of water

19. Sprinklers – devices that throw water through the air, usually in a circular pattern, for a predetermined distance

20. Station – a circuit on an irrigation controller that can be programmed with a run time separate from other circuits and provides power to one or more remote control valves

21. Uniformity – the evenness of precipitation over a given area

Unit 6: Equipment and Equipment Maintenance

1. Agitator – keeps the water and pesticide in motion so the concentration of pesticide is uniformly mixed with the carrier at all times
2. Air cooled engine – an engine that circulates air around the cylinder block and cylinder head to maintain the desired engine temperature
3. Bedknife – a stationary blade of tempered steel that forms a shearing action with the rotating reel
4. Boom sprayer – a mechanical driven device equipped with spray nozzles and a holding tank used to apply a pressurized liquid evenly over the turf
5. Calibrate – to adjust the mix of pesticide and carrier with the speed and pressure of the boom sprayer so the correct amount of pesticide is applied
6. Carburetor – properly mixes filtered air with fuel
7. Combustion – the rapid, oxidizing chemical reaction in which a fuel chemically combines with oxygen in the atmosphere and releases energy in the form of heat
8. Connecting rod – connects the piston to the crankshaft
9. Crankshaft – connected to the piston by a connecting rod and converts up and down motion to rotary motion
10. Cylinder head – provides a seal for one end of the cylinder bore
11. Discharge mower deck – a support unit for the rotating blades that also provides a passage for the cut grass material to be discharged usually to the side of the cutting unit
12. Engine block – the main structure of an engine which supports and helps maintain alignment of internal and external components
13. Environmental Protection Agency (EPA) – a federal agency established in 1970 to control and abate pollution in the areas of air, water, solid waste, pesticides, radiation and toxic substances
14. Flywheel – component on the end of a crankshaft that keeps it turning between power strokes
15. Fuel injector – a component in the cylinder head that sprays fuel into cylinder in an atomized form
16. Gallons Per Acre (GPA)
17. Governor – controls speed
18. Ground driven reel – wheel mowers that use the wheel contact to ground as the power source to turn the reel
19. Hydraulic driven reel – mowers that use hydraulic power

20. Injection pump – driven by camshaft gear as it pumps a measured amount of diesel fuel under pressure to each injector
21. Internal combustion engine – an engine that generates head energy from the combustion of fuel inside the engine
22. Mower operator – person responsible for properly driving the pulling unit and for the proper adjustment of each mower unit throughout the day as needed
23. Multicylinder – more than one cylinder served by one crankshaft
24. Nozzle – a device located on the boom that delivers the correct spray pattern to the turf
25. Octane – a rating of gasoline based upon its antiknocking characteristics
26. Operator – the person who operates the equipment applying the pesticide
27. Piston – plug that moves up and down in the cylinder bore
28. Piston rings – located in the piston groove that provides a seal at the cylinder wall
29. Pressure gauge – a gauge used to measure pressure (in pounds per square inch – psi) in the sprayer system
30. Pump – a mechanical device driven by a power source to create a flow of liquid in the sprayer system
31. Reel – a curved, rotating blade of tempered steel
32. Regulator valve – a device located between the nozzles and holding tank on the return side and used to regulate pressure in the sprayer system
33. Valves – provide entrance into combustion chamber for filtered air